H.T.No. | | | | | | | | | | |

Code No: EE1520 **GEC-R14**

III B. Tech I Semester Regular Examinations, November 2016

ELECTRICAL MACHINES-III

(Electrical and Electronics Engineering)

Time: 3 Hours **Max. Marks: 60**

Note: All Questions from **PART-A** are to be answered at one place.
Answer any **FOUR** questions from **PART-B.** All Questions carry equal Marks.

PART-A

6 × 2 = 12M

1. State the various methods for elimination of harmonics from the voltage waveform of an alternator.
2. The synchronous reactance of a 440V, 50Hz, 11 kVA alternator is 5Ω. Determine short circuit ratio of the alternator.
3. Compare between M.M.F method and Potier method.
4. a) What is the effect of varying excitation of an alternator running in parallel with another alternator?
   b) The power angle at which synchronous generator will develop maximum power is_____________.
5. a) List various starting methods of synchronous motors.
   b) Draw excitation circles for cylindrical rotor synchronous motor.
6. What will happen if a d-c series motor is connected to 1-Ø ac supply main?

PART-B

4 × 12 = 48M

1. a) Explain suppression of harmonics in synchronous machines. (6M)
   b) A 3 phase, 25 Hz, star connected alternator has 12 poles. The armature has 180 slots containing a two layer winding with 4 conductors per slot. All the conductors are connected in series. The flux per pole is 5×10^7 lines sinusoidally distributed and the machine is driven at its rated speed. The coil span is 12 slots. Determine the emf induced per phase and the voltage between the terminals. (6M)
2. a) Explain the concept of replacing the armature reaction by a reactance. (6M)
   b) A 3-phase, star connected alternator is rated at 1600 kVA, 13500V. The armature effective resistance and synchronous reactance are 1.5 ohms and 30 ohms respectively per phase. Calculate the percentage regulation for a load of 1280 kW at power factors of (i) 0.8 leading (ii) unity (iii) 0.8 lagging. (6M)

3. A 1 MVA, 11 kV, 3-phase, star connected synchronous machine has following OCC test data: (12M)

I_f (A)	50	110	140	180
E_{OL}(kV)	7	12.5	13.75	15

(where E_{OL} is the line voltage at no load)
The short circuit test yielded full load current at a field current of 60 A. The ZPF test yielded a full load current at terminal voltage for a field current of 150A. The armature resistance is negligible. Calculate the voltage regulation at full load 0.866 pf lagging by Potier triangle method.

4. a) For two alternators running in parallel, derive the equations giving the load currents shared by each. (6M)

   b) Two similar three phase star connected alternators supply a parallel load of 1000kW at 10 kV at a pf of 0.8 lagging, sharing the load equally. The synchronous impedance of each machine is 4 + j50 Ω/phase. The field excitation of first machine is so adjusted that its armature current is 50 A lagging. Determine the armature current and pf of the second machine and the excitation emf of the first machine. (6M)

5. a) Explain from physical considerations how a synchronous motor can be made to operate at leading or lagging p.f. Verify the above conclusions with suitable phasors diagrams. (6M)

   b) A 2000V, 3-Ø, 4 pole star-connected synchronous motor runs at 1500 rpm. The excitation is constant and corresponding to an open circuit voltage of 2000V. The resistance is negligible in comparison with synchronous reactance of 3.5Ω/ phase. For an armature current of 200A, determine i) Power factor ii) Power input and iii) Torque developed. (6M)

6. a) Explain the Universal Motor in detail with neat circuits and Speed-Torque characteristics. (6M)

   b) Draw the characteristics of AC series motor and explain in detail. State its applications. (6M)

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